

design pavement temperature.

*By Air Temperature:* The designer determines design air temperatures, which are converted to design pavement temperatures.

The Superpave software provided a database of temperature information for over 6000 weather stations in the US and Canada to allow users to select binder grades for the climate at the project location. For each year that these weather stations have been in operation, the hottest seven-day period was identified and the average maximum air temperature for this seven-day period was calculated. For all the years of operation, the mean and standard deviation of the seven-day average maximum air temperature was calculated. Similarly, the one-day minimum air temperature of each year was identified and the mean and standard deviation were calculated. Weather stations with less than 20 years of data were not used.

However, the design temperatures to be used for selecting asphalt binder grade are the pavement temperatures, not the air temperatures. For surface layers, Superpave defines the high pavement design temperature at a depth 20 mm below the pavement surface, and the low pavement design temperature at the pavement surface.

Using theoretical analyses of actual conditions performed with models for net heat flow and energy balance, and assuming typical values for solar absorption (0.90), radiation transmission through air (0.81), atmospheric radiation (0.70), and wind speed (4.5 m/sec), this equation was developed for the high pavement design temperature:

$$T_{20\text{mm}} = ( T_{\text{air}} - 0.00618 \text{ Lat}^2 + 0.2289 \text{ Lat} + 42.2 ) ( 0.9545 ) - 17.78$$

where  $T_{20\text{mm}}$  = high pavement design temperature at a depth of 20 mm  
 $T_{\text{air}}$  = seven-day average high air temperature, °C  
Lat = the geographical latitude of the project in degrees.

There are two possible ways to determine the low pavement design temperature in Superpave. First, the low pavement design temperature simply can be assumed to be the same as the low air temperature. This